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Service Manual

416F BACKHOE LOADER

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Product: BACKHOE LOADER
Model: 416F BACKHOE LOADER LWT
Configuration: 416F Backhoe Loader LWT00001-UP (MACHINE) POWERED BY C4.4, 3054C Engine

Disassembly and Assembly
C4.4 (Mech) Engines for Caterpillar Built Machines
Media Number -KENR9210-10 **Publication Date -01/12/2014** **Date Updated -08/08/2018**

i02763465

Accessory Drive - Remove and Install

SMCS - 1207-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	8H-0663	Bearing Puller	1
	5F-7345	Puller	1
	126-7183	Crossblock	1
	126-7177	Puller Leg	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers

before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

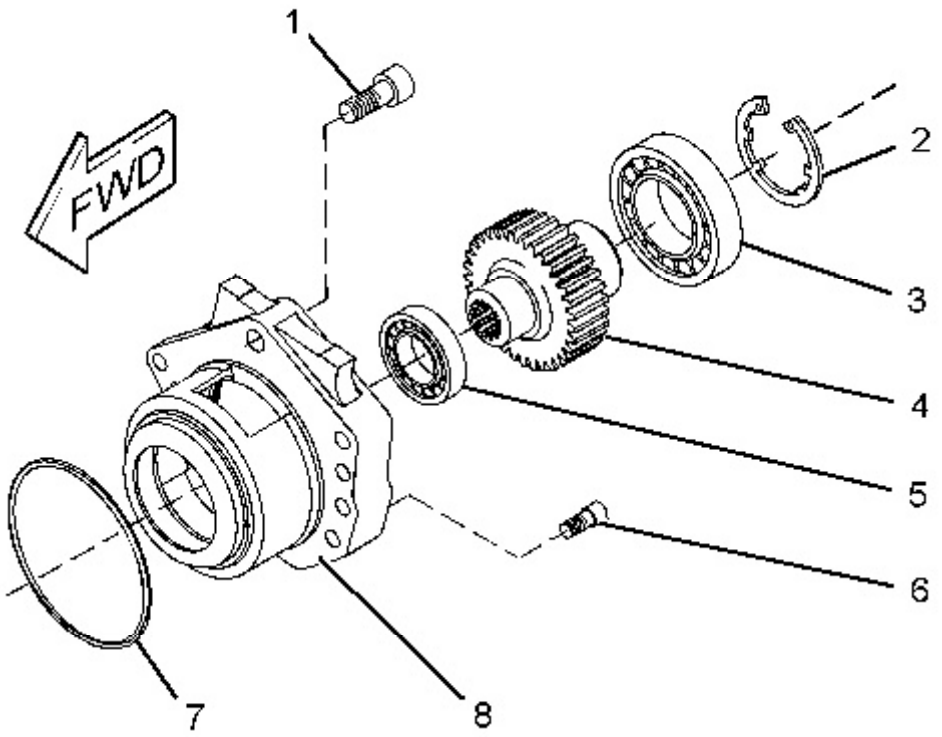

Illustration 1 g01269954

Typical example

1. Remove allen head screw (1) from accessory drive housing (8). Remove allen head screws (6) from accessory drive housing (8).
2. Remove accessory drive housing (8) from the front housing.
3. If necessary, follow Steps 3.a through 3.c in order to disassemble the accessory drive.
   a. Remove circlip (2) from accessory drive housing (8).
   b. Place accessory drive housing (8) onto a suitable support. Press the assembly of gear (4) and bearings (3) and (5) out of accessory drive housing (8). Use a Tooling (A) in order to remove bearings (3) and (5) from gear (4).
   c. Remove O-ring seal (7) from accessory drive housing (8).

Installation Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
B	7M-7456	Bearing Mount Compound	-
C	207-1601	Rubber Lubricant	1
D	9S-3263	Thread Lock Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

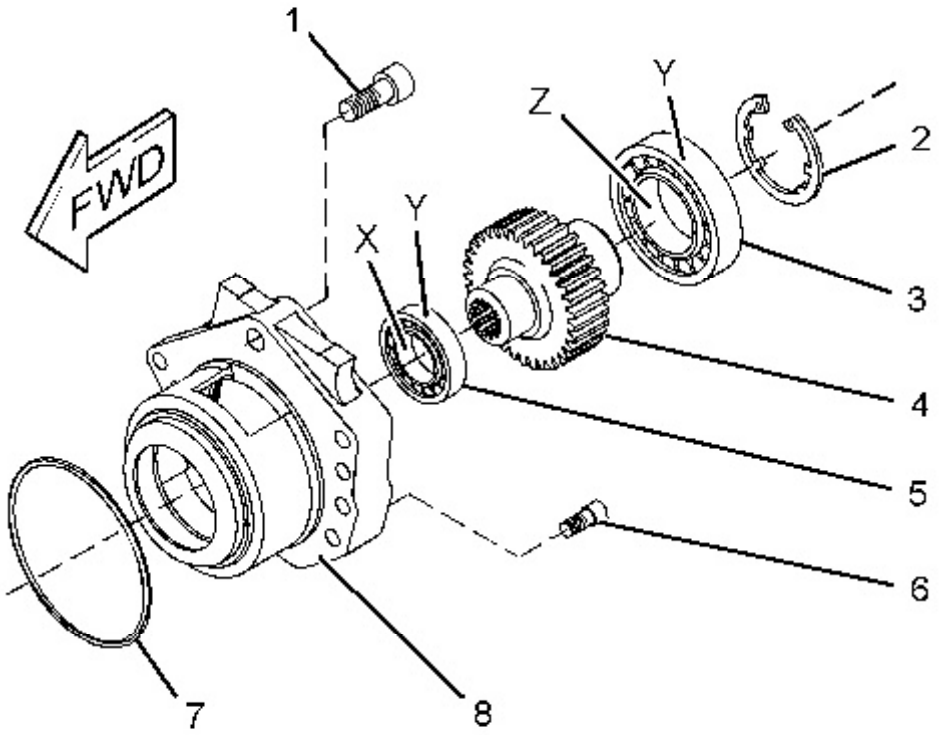

Illustration 2 g01264852

Typical example

1. If necessary, follow Steps 1.a through 1.e in order to assemble the accessory drive.

    a. Inspect the condition of the teeth and the splines of gear (4) for wear or damage. Inspect bearings (3) and (5), circlip (2), and the front housing for wear or damage. Replace any components that are worn or damaged.

    b. Apply a small continuous bead of Tooling (B) to inner surface (X) of bearing (5). Place the gear shaft on a suitable support. Press on the inner race of bearing (5) until the bearing (5) is against the shoulder of gear (4). Remove any excess sealant.

    c. Apply a small continuous bead of Tooling (B) to inner surface (Z) of bearing (3). Place the inner race of bearing (3) onto a suitable support. Press the shaft of gear (4) into bearing (3) until the shoulder of the gear is against the bearing. Remove any excess sealant.

    d. Apply a small continuous bead of Tooling (B) to the outer surface (Y) of bearings (3) and (5). Place accessory drive housing (8) on a suitable support. Press the assembly of the gear into the accessory drive housing. Ensure that bearing (5) is against the front face of the recess in accessory drive housing (8). Remove any excess sealant.

    e. Install circlip (2) into the groove in accessory drive housing (8). Ensure that circlip (2) is correctly positioned in the groove.

2. Lightly lubricate a new O-ring seal (7) with Tooling (C). Install the O-ring seal into the groove in accessory drive housing (8).

3. Inspect the bore in the front housing for damage. If necessary, replace the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove" and Disassembly and Assembly, "Housing (Front) - Install".

4. Lightly lubricate bearing (3), bearing (5), and gear (4) with clean engine lubricating oil. Install the assembly of the accessory drive to the front housing. Ensure that the flange on the accessory drive housing is flush with the front housing.

5. Apply Tooling (D) to allen head screws (1) and (6). Install allen head screws (1) and (6) to accessory drive housing (8).

6. Tighten the allen head screws to a torque of 22 N·m (16 lb ft).

7. Ensure that there is tactile backlash between the idler gear and the accessory drive gear.

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Product: BACKHOE LOADER
Model: 416F BACKHOE LOADER LWT
Configuration: 416F Backhoe Loader LWT00001-UP (MACHINE) POWERED BY C4.4, 3054C Engine

Disassembly and Assembly
C4.4 (Mech) Engines for Caterpillar Built Machines
Media Number -KENR9210-09 **Publication Date -01/12/2014** **Date Updated -13/07/2017**

i02763563

Air Compressor - Remove and Install

SMCS - 1803-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Name**	**Qty**
A[1]	9U-6198	Crankshaft Turning Tool	1
A[2]	9U-7336	Housing	1
	5P-7305	Engine Turning Tool	1
B	230-6283	Timing Pin (Crankshaft)	1
C	1P-2320	Combination Puller	1

(1) The Crankshaft Turning Tool is used on the front pulley.

(2) This Tool is used in the aperture for the electric starting motor.

Note: Either Tooling (A) can be used. Use the Tooling that is most suitable.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Put identification marks on all hoses, on all hose assemblies and on all tube assemblies for installation purposes. Plug all hose assemblies and tube assemblies. This helps to prevent fluid loss and this helps to keep contaminants from entering the system.

WARNING

Do not disconnect the air lines until the air pressure in the system is at zero. If hose is disconnected under pressure it can cause personal injury.

1. Release the pressure from the air system.
2. Drain the coolant from the cooling system into a suitable container for storage or for disposal. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Change" for the correct draining procedure.
3. Remove the front cover. Refer to Disassembly and Assembly, "Front Cover - Remove and Install".
4. If the engine is equipped with a hydraulic pump on the rear of the air compressor, remove the hydraulic pump.
5. Use Tooling (A) in order to rotate the crankshaft so that number one piston is at the top center position on the compression stroke. Refer to Systems Operation, Testing and Adjusting, "Finding Top Centre Position for No.1 Piston".

   Note: The air compressor must be timed with the engine in order to minimize engine vibration.

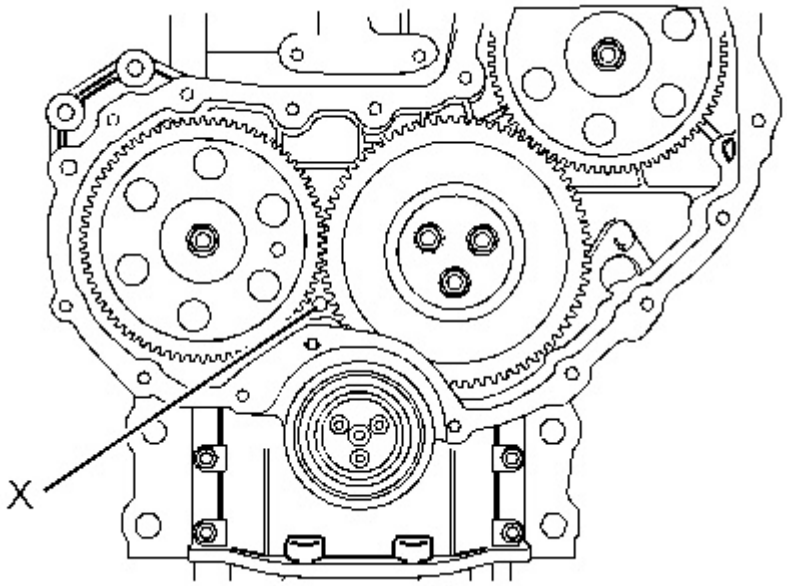

Illustration 1 g01272266

Typical example

6. Install Tooling (B) through hole (X) in the front housing. Use Tooling (B) in order to lock the crankshaft.

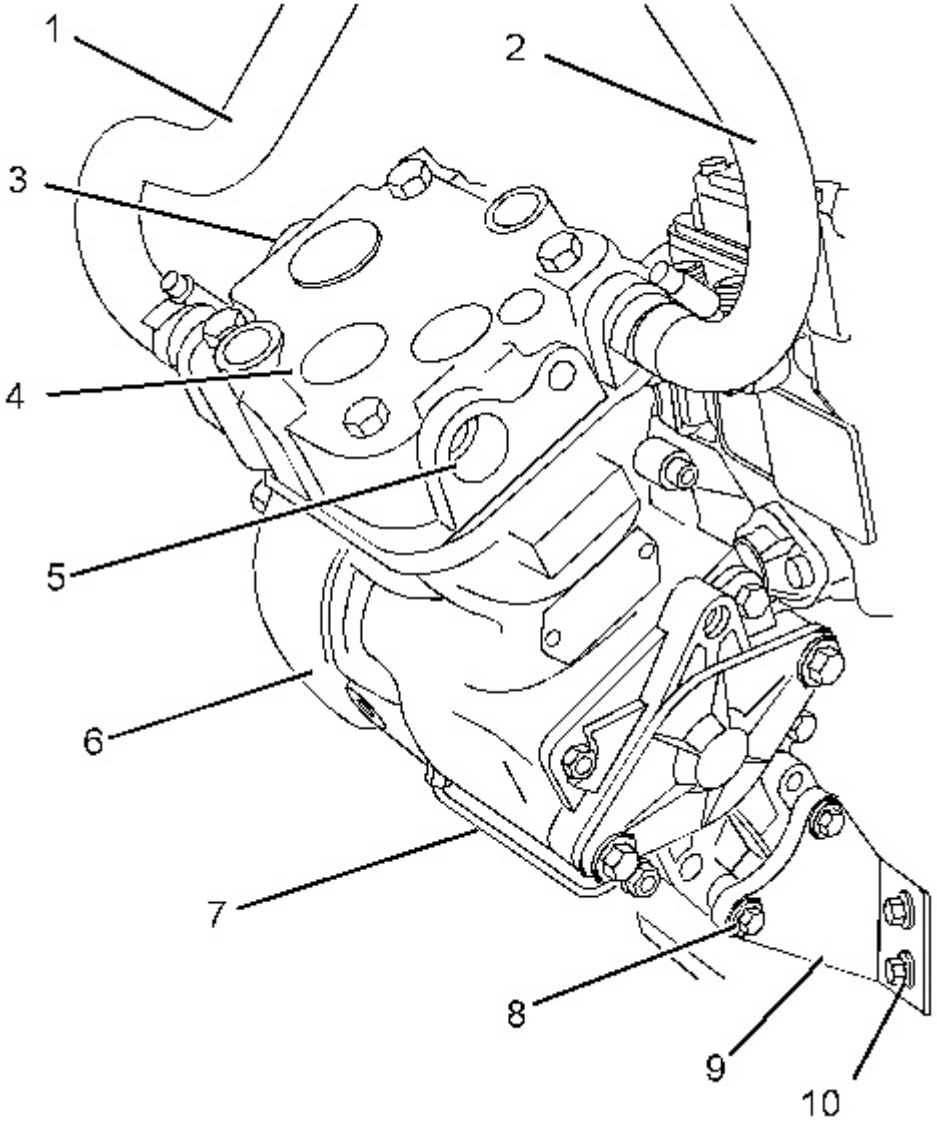

Illustration 2 g01250794

Typical example

7. Disconnect coolant hoses (1) and (2) from air compressor (4).
8. Disconnect the air lines from ports (3) and (5).
9. Remove tube assembly (7) from air compressor (4) and from the cylinder block.
10. Remove bolts (8) and (10) from support bracket (9) and remove the support bracket.

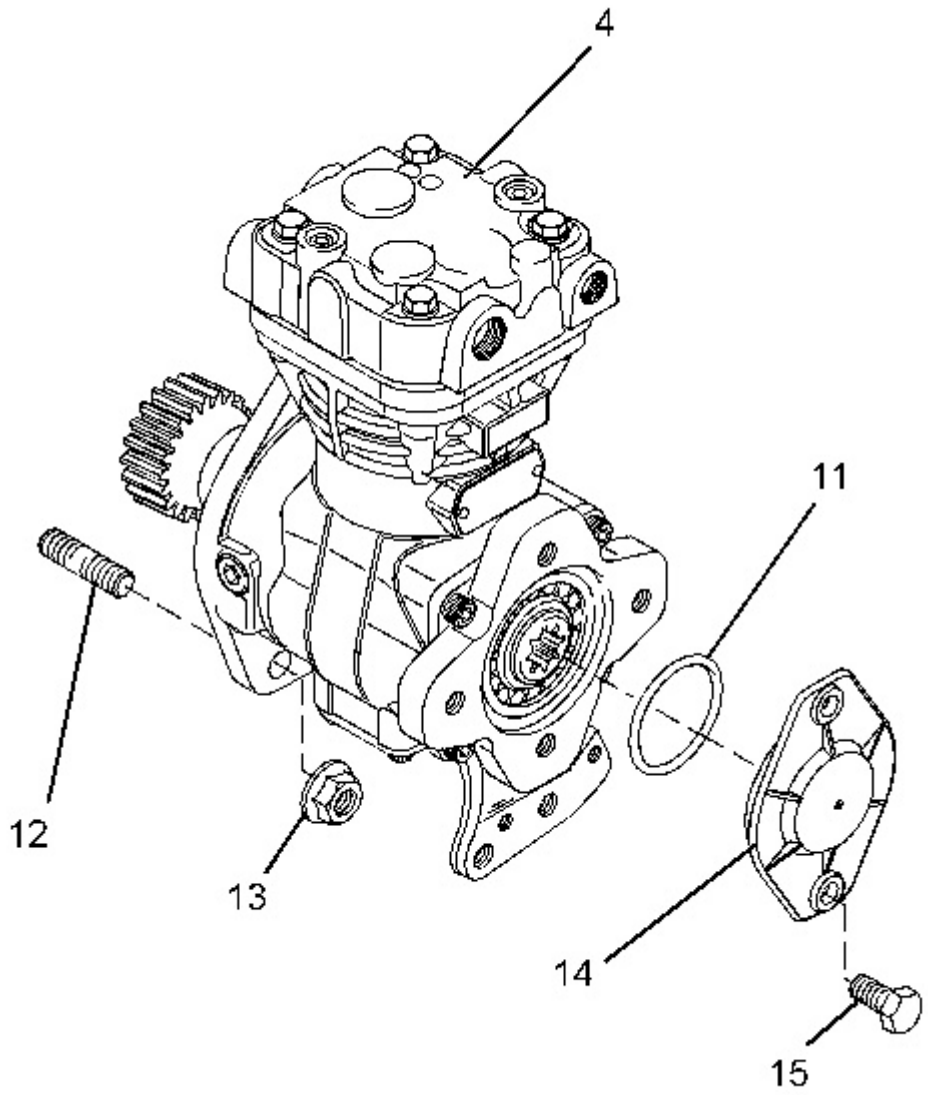

Illustration 3 g01250816

Typical example

11. Support air compressor (4). Remove nuts (13) and remove the air compressor from front housing (6).

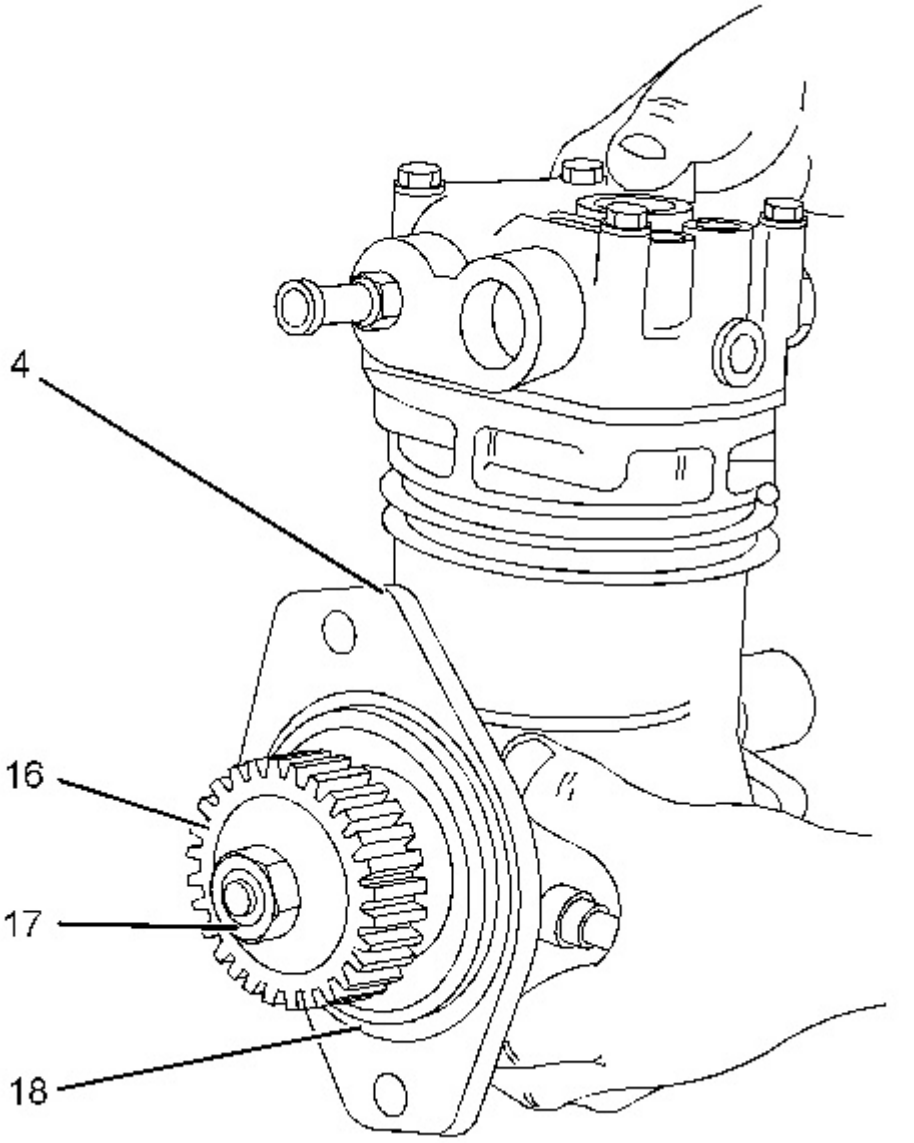

Illustration 4 g01250889

Typical example

12. Remove O-ring seal (18) from air compressor (4).
13. If necessary, remove bolts (15) and remove plate (14). Remove O-ring seal (11) from plate (14). Refer to Illustration 3.
14. If necessary, remove nut (17) and remove the spring washer. Use Tooling (C) in order to remove gear (16) from the crankshaft of the air compressor.

Installation Procedure

Table 2

Required Tools			

Tool	Part Number	Part Name	Qty
B	230-6283	Timing Pin (Crankshaft)	1
D	4C-9506	Retaining Compound	1
E	1U-6396	O-Ring Assembly Compound	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

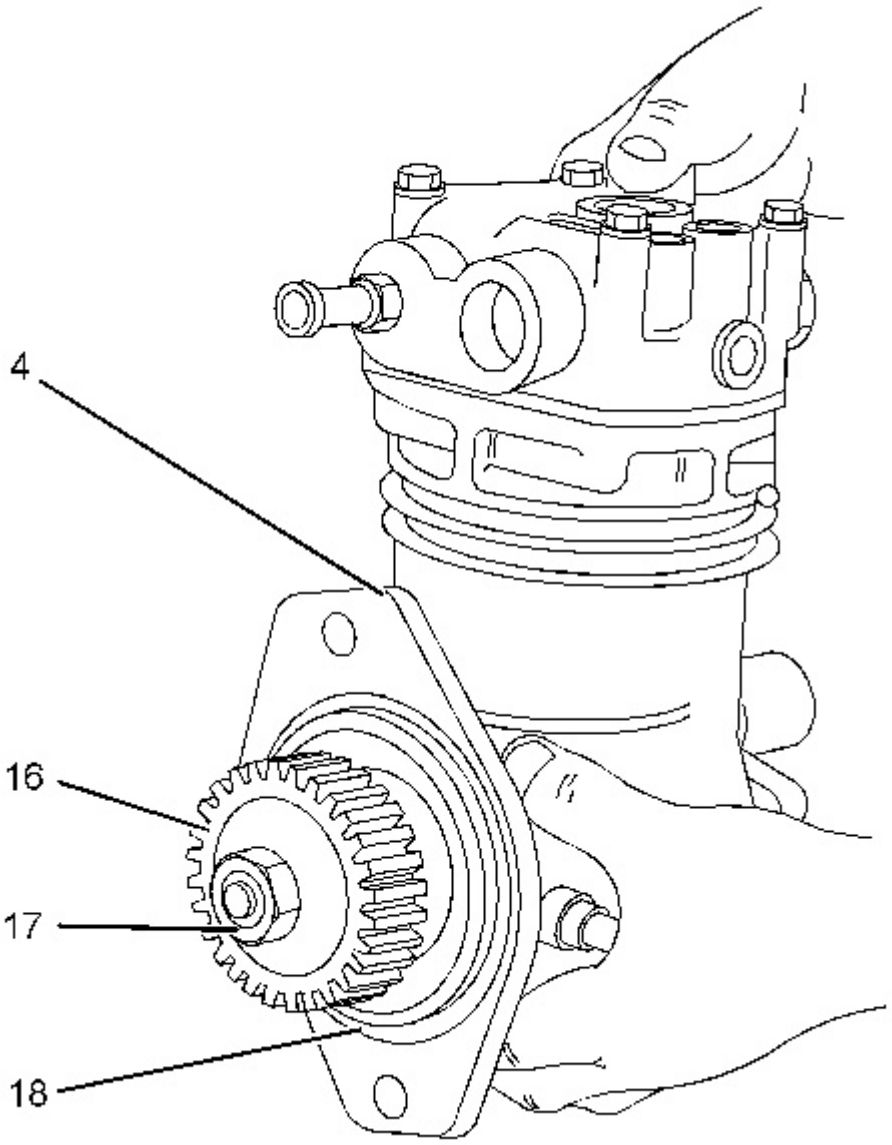

Illustration 5 g01250889

Typical example

1. If necessary, follow Steps 1.a through 1.b in order to install the gear to the air compressor.
   a. Ensure that the shaft of air compressor (4) is clean and dry. Ensure that gear (16) is clean and free from damage.
   b. Install gear (16) and a new spring washer to the shaft of the air compressor.
   c. Apply Tooling (D) to the threads of the shaft. Install nut (17) to the shaft of air compressor (4). Tighten the nut to a torque of 120 N·m (89 lb ft).
2. Install the O-ring seal to air compressor (4). Use Tooling (E) in order to lubricate the O-ring seal.
3. Ensure that number one piston is at the top center position on the compression stroke. Refer to Systems Operation, Testing and Adjusting, "Finding Top Center Position for No. 1 Piston".

Note: The air compressor must be timed with the engine in order to minimize engine vibration.

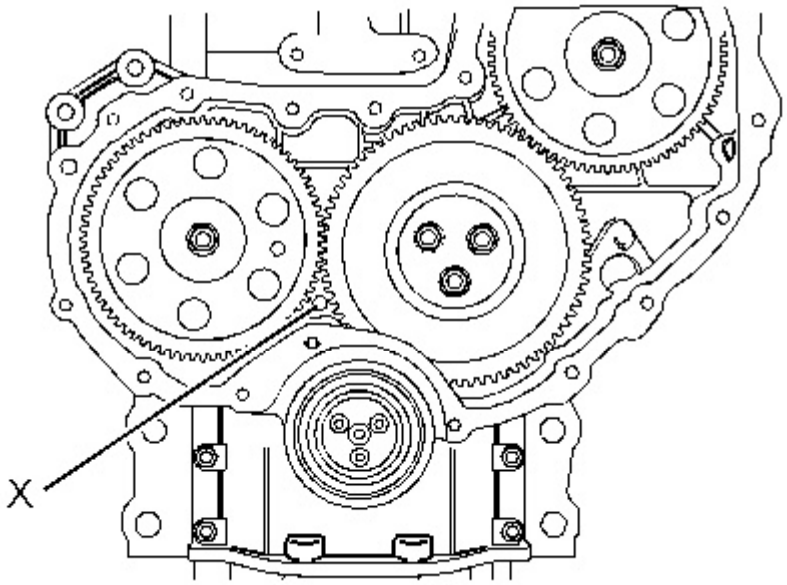

Illustration 6 g01272266

Typical example

4. Ensure that Tooling (B) is installed in hole (X) in the front housing. Use Tooling (B) in order to lock the crankshaft in the correct position.

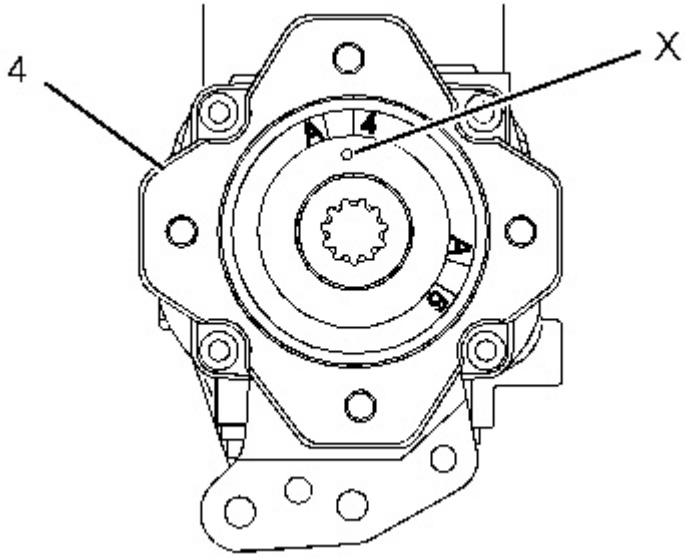

Illustration 7 g01250968

Typical air compressor with a SAE drive

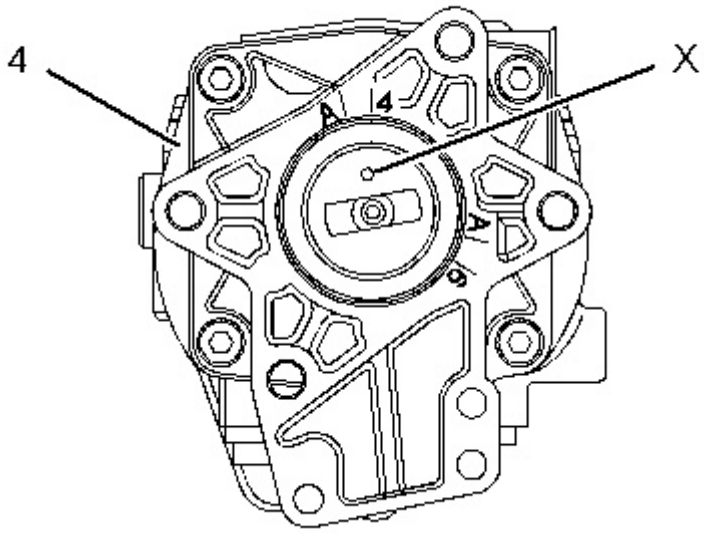

Illustration 8 g01251223

Typical air compressor with a DIN drive

5. Rotate the crankshaft of the air compressor until the timing mark (X) is aligned with the timing mark A4 on the rear face of air compressor (4). Refer to Illustration 7 for air compressors with a SAE drive. Refer to Illustration 8 for air compressors with a DIN drive.

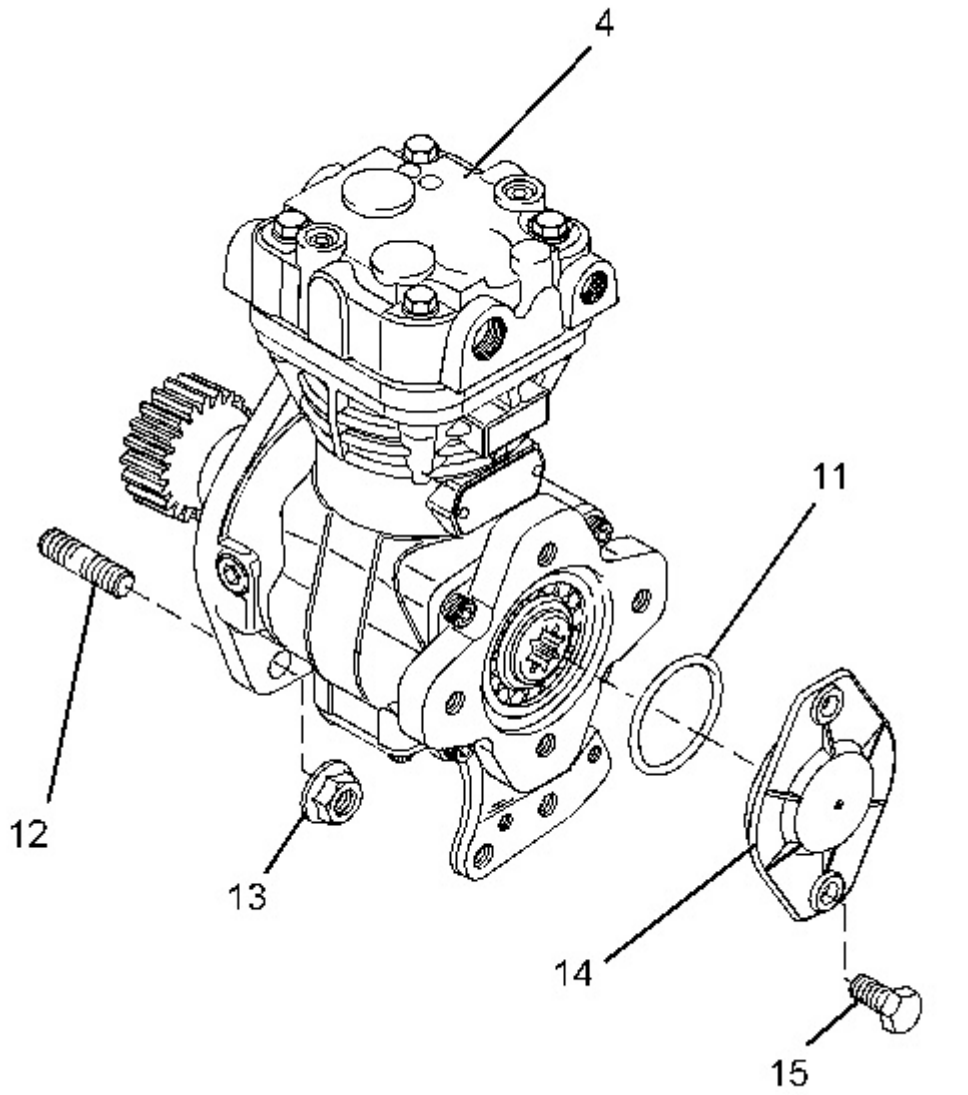

Illustration 9 g01250816

Typical example

6. Align air compressor (4) with studs (12). Install the air compressor to the front housing. If necessary, rotate the crankshaft of the air compressor in a clockwise direction in order to align the gears.

   Note: Ensure that timing mark (X) is aligned with the timing mark A4. Refer to Illustration 7 for air compressors with a SAE drive. Refer to Illustration 8 for air compressors with a DIN drive.

7. Install nuts (13). Tighten the nuts to a torque of 78 N·m (58 lb ft).

8. If necessary, follow Steps 8.a through 8.c in order to install cover (14).

   a. Install a new O-ring seal (11) to cover (14). Use Tooling (E) in order to lubricate the O-ring seal.

b. Install cover (14) to air compressor (4).

c. Install bolts (15). Tighten the bolts to a torque of 13 N·m (9.5 lb ft).

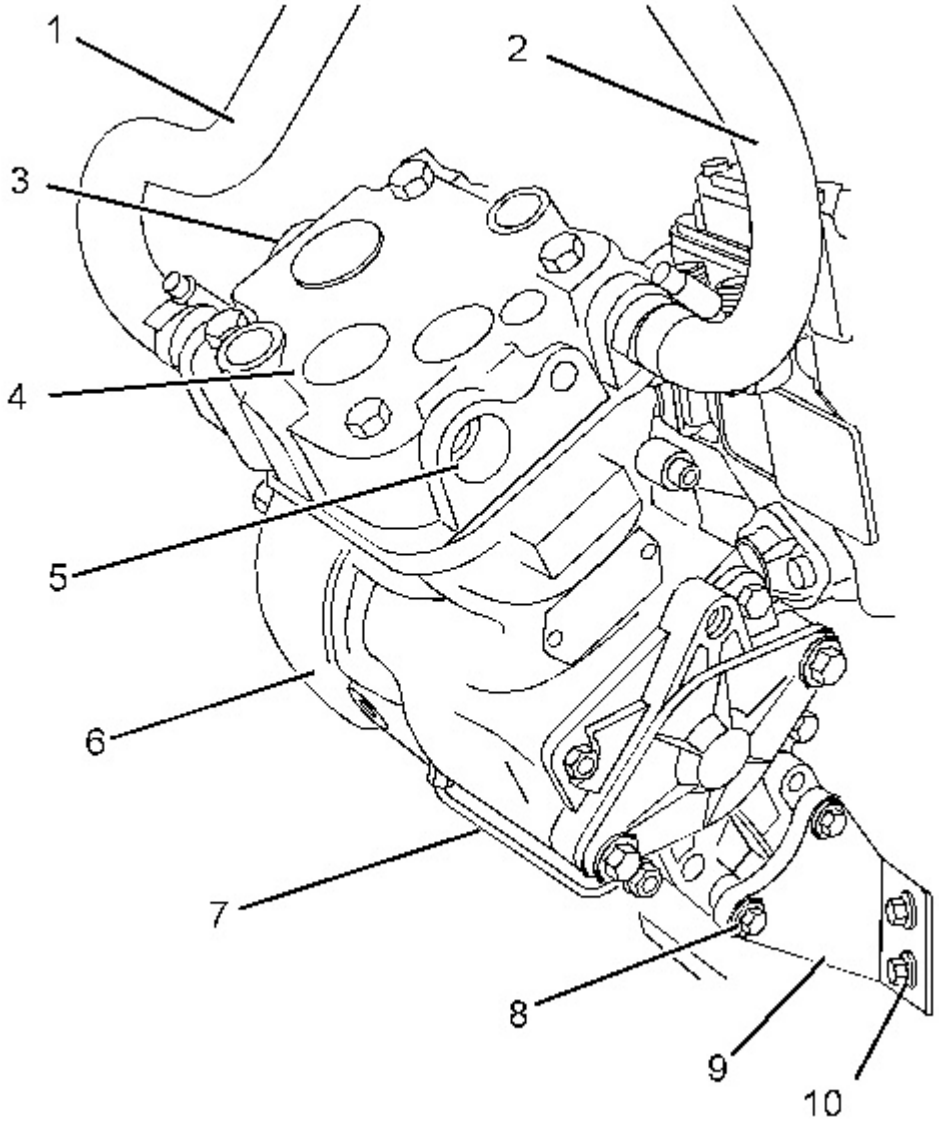

Illustration 10 g01250794

Typical example

9. Position support bracket (9) onto air compressor (4). Install bolts (8) finger tight.

10. Install bolts (10) finger tight.

11. Tighten bolts (8) to a torque of 22 N·m (16 lb ft). Tighten bolts (10) to a torque 22 N·m (16 lb ft).

Note: Ensure that the air compressor is not stressed as the bolts are tightened.

12. Install tube assembly (7) to air compressor (4) and to the cylinder block. Tighten the nuts to a torque of 9 N·m (80 lb in).

13. Remove Tooling (B) from hole (X) in the front housing.

14. Install the front cover. Refer to Disassembly and Assembly, "Front Cover - Remove and Install".

15. If the engine is equipped with a hydraulic pump on the rear of the air compressor, install the hydraulic pump.

16. Connect the air lines to ports (3) and (5) in the air compressor.

17. Connect coolant hoses (1) and (2) to air compressor (4).

18. Fill the cooling system with coolant to the correct level. Refer to the Operation and Maintenance Manual.

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Product: BACKHOE LOADER
Model: 416F BACKHOE LOADER LWT
Configuration: 416F Backhoe Loader LWT00001-UP (MACHINE) POWERED BY C4.4, 3054C Engine

Disassembly and Assembly
C4.4 (Mech) Engines for Caterpillar Built Machines
Media Number -KENR9210-09 **Publication Date -01/12/2014** **Date Updated -13/07/2017**

i02763558

Alternator - Install - Engines With an Automatic Belt Tensioner

SMCS - 1405-012

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

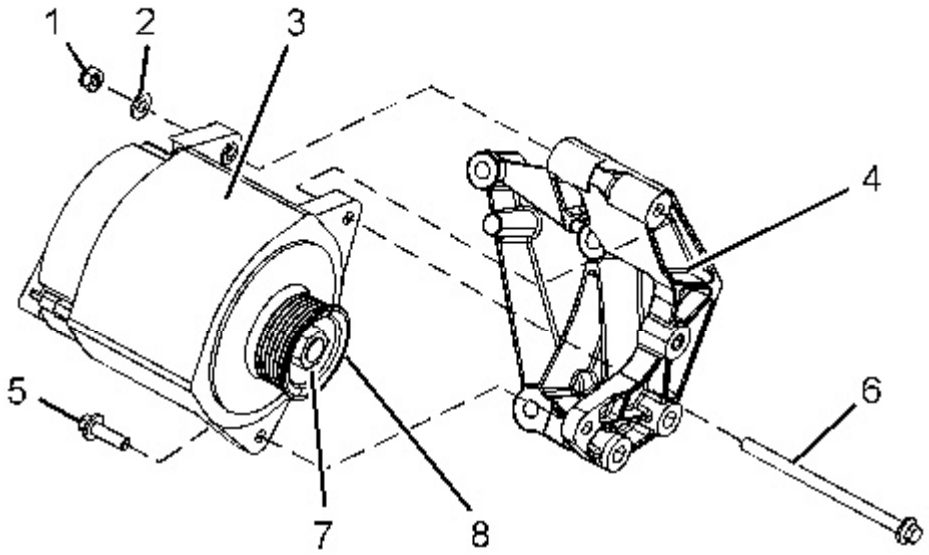

Illustration 1 g01271317

Typical example

1. If necessary, install pulley (8) and nut (7) to alternator (3). Hold the shaft of the alternator with an allen wrench. Use a cranked ring spanner (box wrench) in order to tighten nut (7).

   Note: Different types of alternator have different sizes of nut. Ensure that the correct torque value is used for the nut.

   Tighten M16 and M17 nuts to a torque of 80 N·m (59 lb ft). Tighten 5/8 inch - 18 UNF nuts to a torque of 102 N·m (75 lb ft).

2. Position alternator (3) on alternator mounting bracket (4).

3. Install bolt (6) to alternator (3). Install washer (2) and nut (1) to bolt (6).

4. Install bolt (5) to alternator (3).

5. Tighten nut (1) and bolt (5) to a torque of 22 N·m (16 lb ft).

6. Connect the wiring harness assembly to alternator (3).

   Note: The incorrect connection of the harness assembly can result in damage to the alternator or failure.

7. Install the alternator belt. Refer to Disassembly and Assembly, "Alternator Belt - Remove and Install".

8. Turn the battery disconnect switch to the ON position.

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Product: BACKHOE LOADER
Model: 416F BACKHOE LOADER LWT
Configuration: 416F Backhoe Loader LWT00001-UP (MACHINE) POWERED BY C4.4, 3054C Engine

Disassembly and Assembly
C4.4 (Mech) Engines for Caterpillar Built Machines
Media Number -KENR9210-09 **Publication Date -01/12/2014** **Date Updated -13/07/2017**

i02763550

Alternator - Install - Engines Without an Automatic Belt Tensioner

SMCS - 1405-012

Installation Procedure

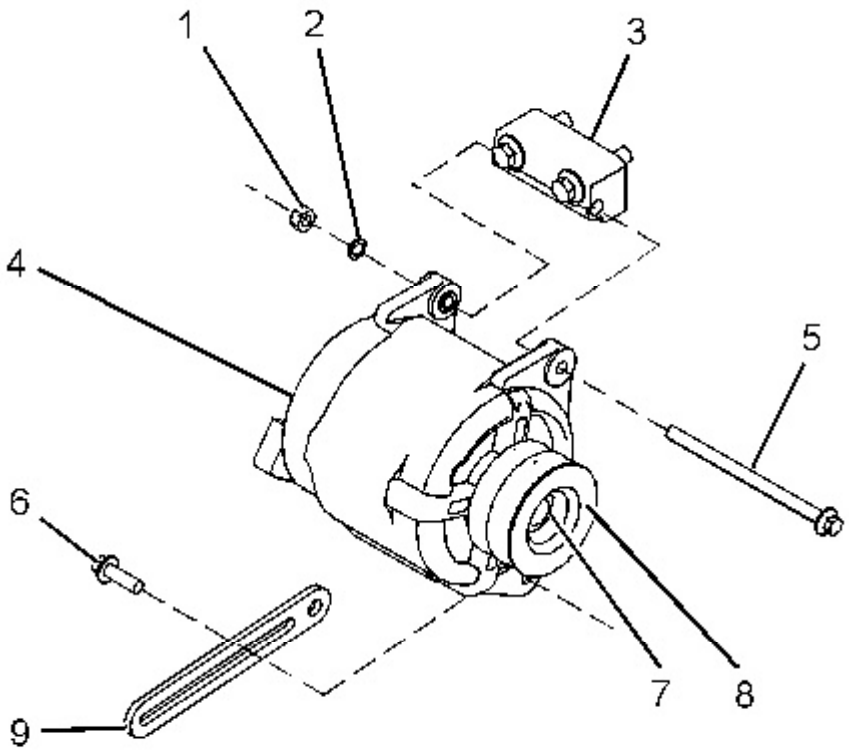

Illustration 1 g01263045

Typical example

1. If necessary, install the pulley to the alternator. Follow Steps 1.a and 1.b for the method in order to install the pulley to the alternator.

   Note: This method may not be suitable for some configurations of pulley.

   a. Install pulley (8) and nut (7) to the shaft of alternator (4).

   b. Hold the shaft of the alternator with an allen wrench. Use a cranked ring spanner (box wrench) in order to tighten nut (7). Tighten the nut to a torque of 80 N·m (59 lb ft).

2. Install alternator (4) to bracket (3) and install bolt (5) to alternator (4).

3. Install washer (2) and nut (1) to bolt (5) finger tight.

4. Install bolt (6) through adjusting link (9) to alternator (4) finger tight.

5. Install the V-belts. Refer to the Disassembly and assembly, "V-belts - Remove and Install" for the correct procedure.

6. Tighten nut (1) and bolt (6) to a torque of 22 N·m (16 lb ft).

7. Connect the harness assembly to alternator (4).

8. Turn the battery disconnect switch to the ON position.

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Product: BACKHOE LOADER
Model: 416F BACKHOE LOADER LWT
Configuration: 416F Backhoe Loader LWT00001-UP (MACHINE) POWERED BY C4.4, 3054C Engine

Disassembly and Assembly
C4.4 (Mech) Engines for Caterpillar Built Machines
Media Number -KENR9210-09 **Publication Date -01/12/2014** **Date Updated -13/07/2017**

i02763557

Alternator - Remove - Engines With an Automatic Belt Tensioner

SMCS - 1405-011

Removal Procedure

Start By:

a. Remove the alternator belt. Refer to Disassembly and Assembly, "Alternator Belt - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

---

1. Turn the battery disconnect switch to the OFF position.
2. Make temporary identification marks on the connections of the harness assembly.

   Note: The incorrect connection of the harness assembly can result in damage to the alternator or failure.

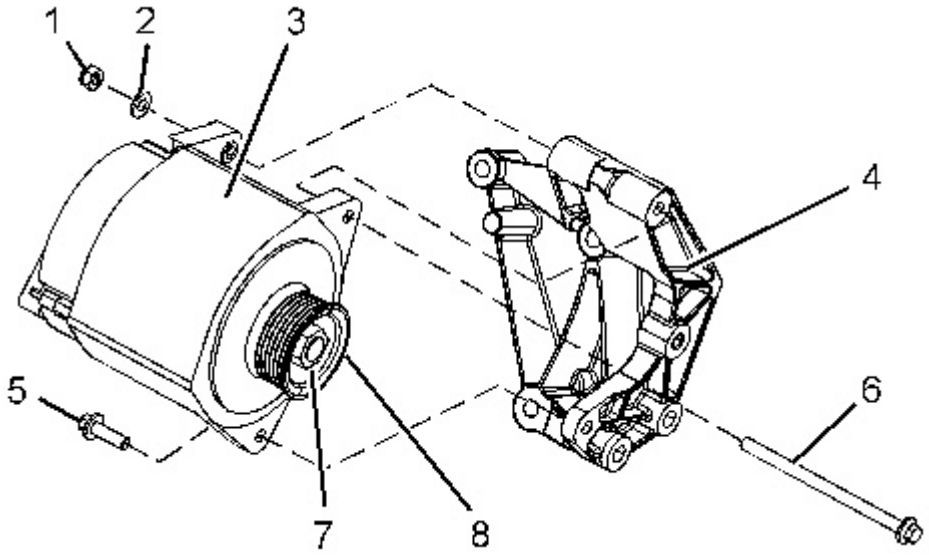

Illustration 1 g01271317

Typical example

3. Disconnect the harness assembly from alternator (3).
4. Remove bolt (5) from alternator (3).
5. Remove nut (1) and washer (2). Remove bolt (6) from alternator (3). Remove the alternator from alternator bracket (4).
6. If necessary, follow Steps 6.a and 6 in order to remove pulley (8) from alternator (1).
   a. Hold the shaft of alternator (3) with an allen wrench. Use a cranked ring spanner (box wrench) in order to loosen nut (7).
   b. Remove nut (7) and pulley (8) from alternator (1).

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